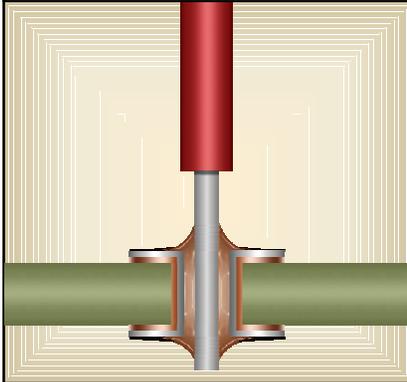


**THROUGH-HOLE SOLDERING  
DISCRETE WIRES**

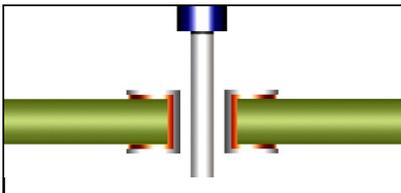


**DISCRETE WIRES**

Designs often require the termination of discrete conductors directly to the printed wiring board, rather than to terminal posts or through a connector. Terminations are typically through-hole, but lap terminations are also possible.

All discrete wires are considered to be components - with the same bending, soldering, and stress relief requirements seen for other discrete axial / radial devices.

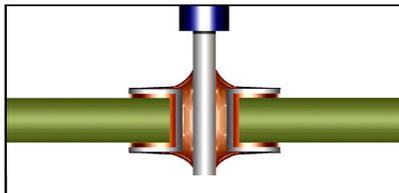
See Section 6.01 "Through-Hole Soldering, General Requirements", for common accept / reject criteria.



**PREFERRED  
THROUGH-HOLE TERMINATION  
INTERIM ASSEMBLY**

The conductor enters the hole, perpendicular to the board surface, and exhibits proper insulation clearance and lead protrusion. The wire end may be clinched to aid assembly.

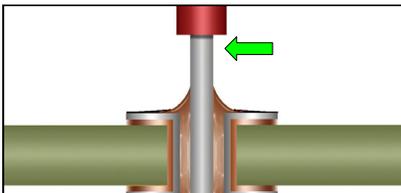
[NASA-STD-8739.3 \[ 8.4 \]](#)



**PREFERRED  
THROUGH-HOLE TERMINATION  
FINAL ASSEMBLY**

The termination exhibits proper insulation clearance and lead protrusion. The termination is fully wetted, with complete fillet formation on both sides of the board.

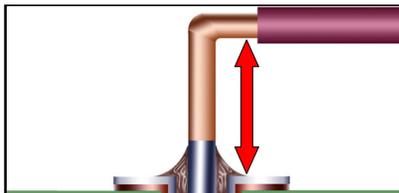
[NASA-STD-8739.3 \[ 8.4 \]](#)



**ACCEPTABLE  
INSULATION GAP**

The insulation gap (referenced from the first point of contact of the conductor to the terminal) shall be less than two (2) wire diameters, but shall not be imbedded in the solder joint. The wire contour shall be visible at the end of the insulation.

[NASA-STD-8739.3 \[ 9.1.1 \], \[ 9.1.2 \]](#)



**UNACCEPTABLE  
EXCESSIVE INSULATION GAP**

The insulation gap exceeds the maximum of two (2) insulated wire diameters, and may present a shorting or birdcaging potential.

[NASA-STD-8739.3 \[ 9.1.1 \], \[ 13.6.2.a.2 \]](#)

**NASA WORKMANSHIP STANDARDS**



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Revision:

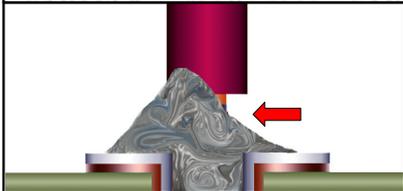
Revision Date:

Book:  
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Section:  
6.15

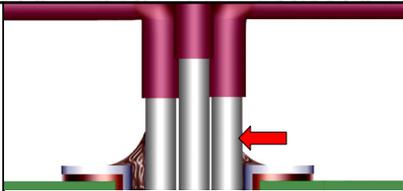
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**THROUGH-HOLE SOLDERING  
DISCRETE WIRES (cont.)**



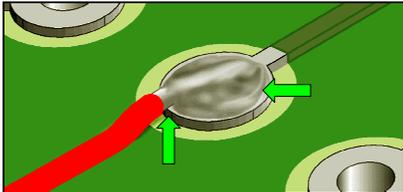
**UNACCEPTABLE  
INSUFFICIENT INSULATION GAP**

The insulation is imbedded in the solder joint and the contour of the conductor is not visible.  
[NASA-STD-8739.3 \[ 9.1.1 \]](#), [\[ 13.6.2.a.2 \]](#)



**UNACCEPTABLE  
MULTIPLE CONDUCTORS**

No more than one conductor shall be inserted into any one hole, unless specified on the engineering documentation.  
[Best Workmanship Practice](#)



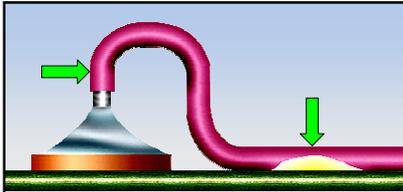
**ACCEPTABLE  
LAPPED TERMINATION**

The termination shall be parallel to the longest dimension of the pad, and exhibit a complete solder fillet around all sides of the lead. The conductor shall not exhibit end overhang. A heel fillet is mandatory.  
[NASA-STD-8739.3 \[ 11.2.5 \]](#)



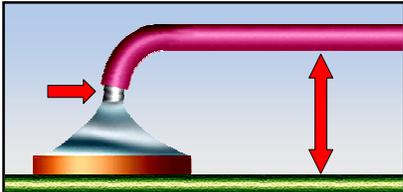
**UNACCEPTABLE  
IMPROPER LAP TERMINATION**

The lap termination shall not overhang the land edge and/or violate minimum electrical spacing.  
[Best Workmanship Practice](#)



**ACCEPTABLE  
STRAIN RELIEF**

Stress relief shall be incorporated, wherever possible, into all leads and conductors terminating in solder connections to provide freedom of movement of part leads or conductors between points of constraint.  
[NASA-STD-8739.3 \[ 8.1.1 \]](#), [\[ 8.1.5 \]](#)



**UNACCEPTABLE  
IMPROPER STRAIN RELIEF**

The termination does not exhibit an acceptable strain relief bend and is not properly staked. There is a potential for any pulling stress to transfer to the solder joint (note the termination is lightly bent) and eventual fracture fatigue.  
[NASA-STD-8739.3 \[ 8.1.1 \]](#), [\[ 13.6.2.a.10 \]](#)

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